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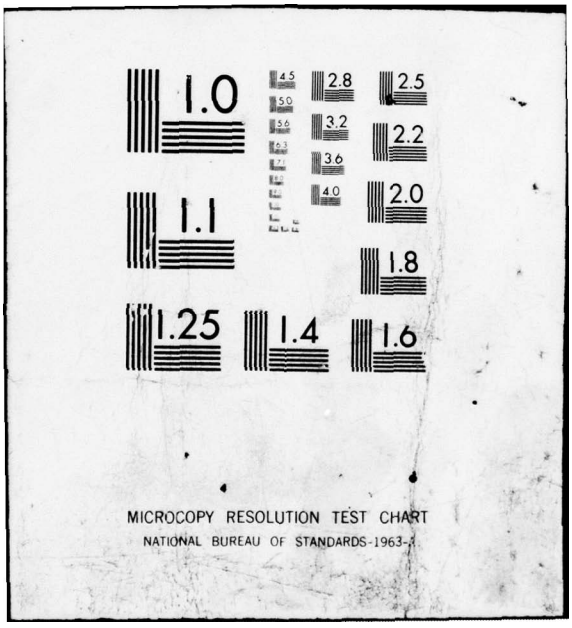
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LEVEL II

UNITED STATES ARMY AEROMEDICAL RESEARCH LABORATORY

IS . . .

USAARL

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This booklet is an orientation guide to the U.S. Army Aeromedical Research Laboratory. It gives a brief introduction to the history, mission and accomplishments of USAARL.

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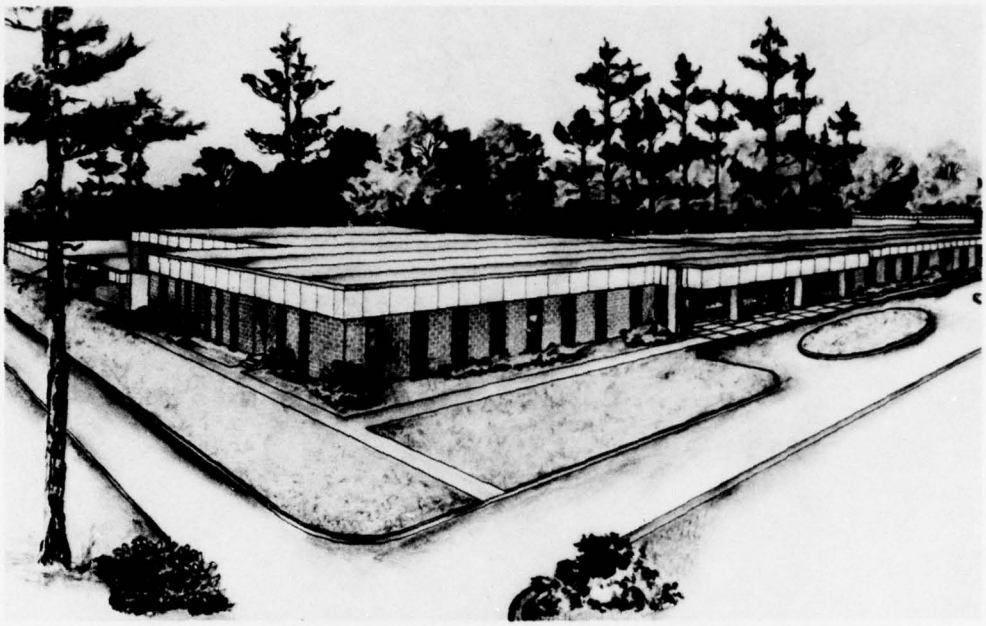
April 1978

U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama 36362



CONCEPT DESIGN FOR
U. S. ARMY AEROMEDICAL RESEARCH LABORATORY

U. S. ARMY AEROMEDICAL RESEARCH LABORATORY

WELCOME

TO

USAARL

COL STANLEY C. KNAPP, COMMANDER

The U. S. Army Aeromedical Research Laboratory is one of eight medical research laboratories of the U. S. Army Medical Research and Development Command, Office of The Surgeon General. We are located at Fort Rucker, Alabama, the center for Army aviation training.

Today our laboratory is found in a collection of World War II buildings that has served to house our myriad research activities since our establishment in 1962. Tomorrow promises us a much anticipated new facility. The construction of the new laboratory will begin in May of 1978 with completion anticipated in 1980.

USAARL conducts fundamental and applied research on the medical aspects of Army aviation and on airborne and ground operations that affect the health, welfare and efficiency of the soldier. We perform medical research on visual/auditory functions, on man/machine integrations, on the medical aspects of non-medical materiel, on physiological responses to the operational environments, and on how military operational training impacts upon ecology. We also provide technical advisory and consultant services to all elements of the Department of Defense and other government agencies in support of helicopter, combat crew and airborne medicine.

Many of our efforts necessarily must be focused on finding solutions to immediate operational problems; however, our fundamental research projects are guided by long-range requirements.

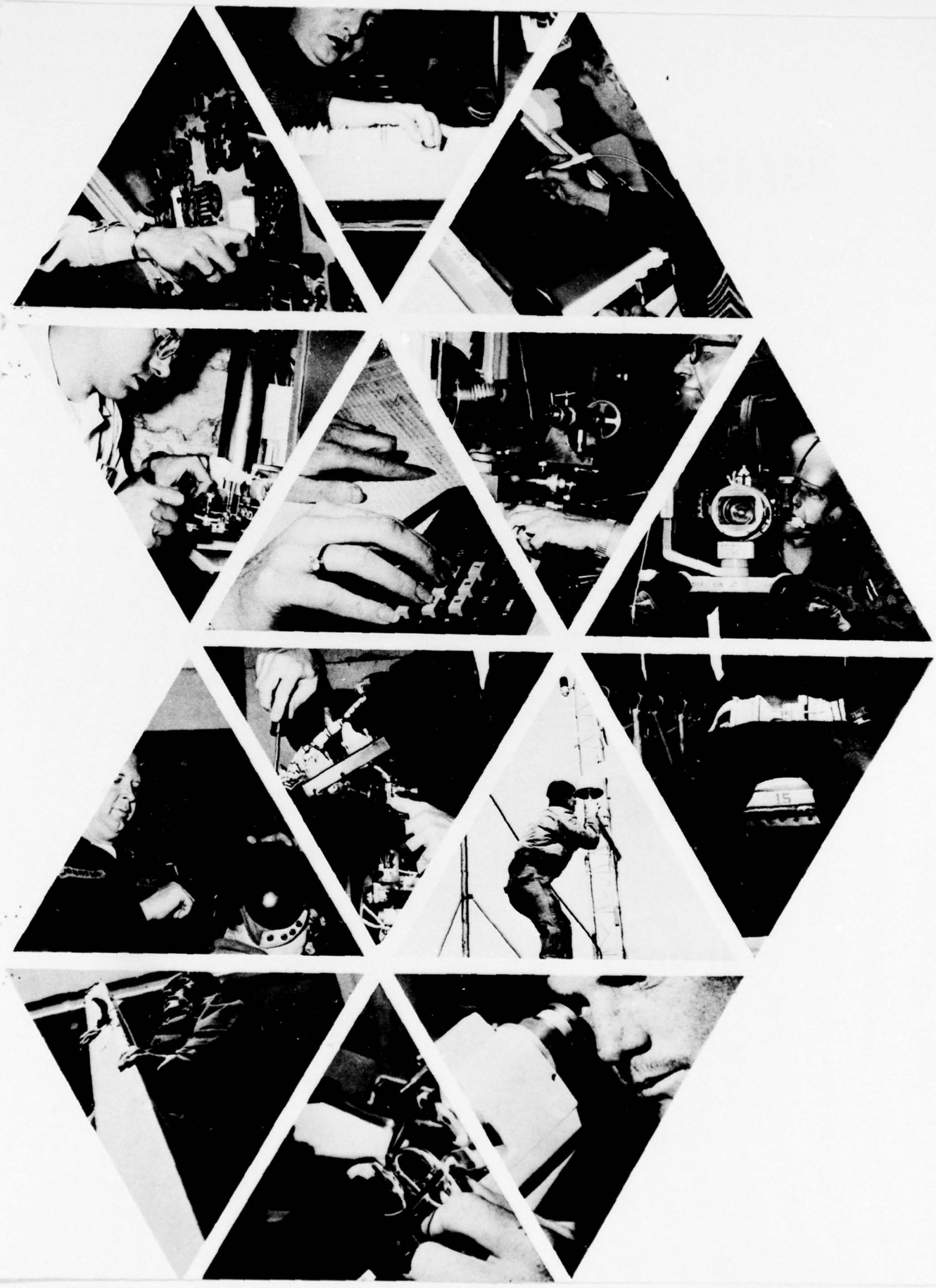
I invite you to look through this booklet and become acquainted with some of USAARL's activities. Come find out what USAARL is!

USAARL

is

PEOPLE AT WORK

One hundred and thirty five people work at 61 different tasks at the laboratory. Of the laboratory's 135 people, 70 are military and 65 are civilian. In all, 52 members of the laboratory hold bachelor or advanced degrees--18 of the advanced degrees are doctorates.



USAARL is A MEMBER OF THE ARMY SUPPORT TEAM

USAARL is in close proximity with other activities concerned with aviation research. Collectively, these organizations form the U.S. Army Aviation Center Team. Close coordination and mutual cooperation enable the Team to exchange ideas and develop new approaches to matters of concern to Army aviation.

Team membership enables USAARL to conceive and conduct a research program that is highly responsive to Army aviation's unique problems and requirements.

Liaison is maintained with research laboratories of other military, governmental, and civilian agencies.

Assistance and cooperative efforts with the Naval Aerospace Medical Research Laboratory at Pensacola, Florida; the U.S. Air Force School of Aerospace Medicine, Brooks AFB, Texas; FAA Civil Aeromedical Institute, Oklahoma City, Oklahoma; the Night Vision Laboratory, Ft. Belvoir, Virginia; the U.S. Army Research and Technology Laboratories, Moffett Field, California; and with many other agencies enhance the research efforts of all the agencies concerned.

DARCOM PROGRAM MANAGERS

TRADOC SYSTEMS MANAGERS

U S ARMY RESEARCH INSTITUTE FIELD UNIT

USAAAVS
U.S. ARMY AGENCY FOR AVIATION SAFETY

CONCERNED CARE
U.S. ARMY AEROMEDICAL CENTER

U. S. ARMY AIRCRAFT DEVELOPMENT TEST ACTIVITY

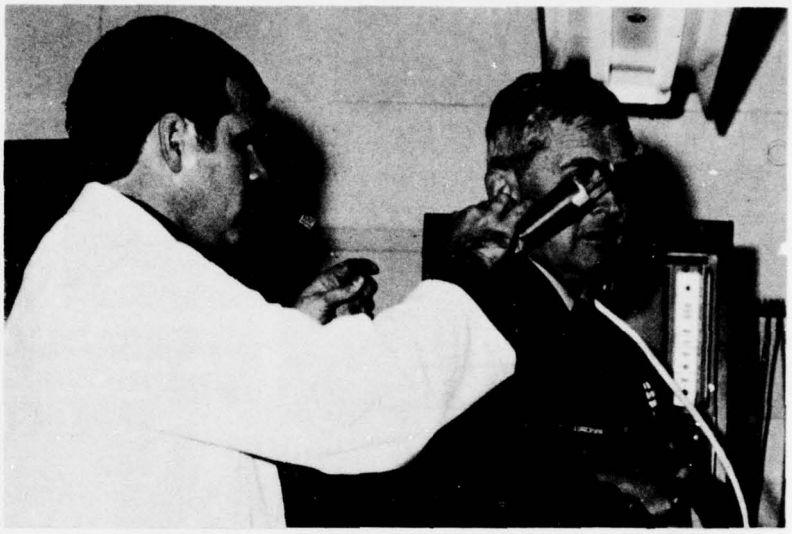
USAARL is RESEARCH

The Army is striving to attain around-the-clock operational capability for its tactical forces. The night vision goggles is one device which is an aid in attaining this capability.

USAARL was in the forefront of the program to evaluate the goggles for aircrew use. Programs were developed to investigate performance in the man-helicopter system which resulted from reduced illumination levels while the aviator was wearing the night vision goggles. Depth discrimination ability and performance during nap-of-the-earth and low level flight of a subject wearing the NVG's were studied. A technique to make the crewstation lighting of Army helicopters compatible with the use of the goggles was developed.

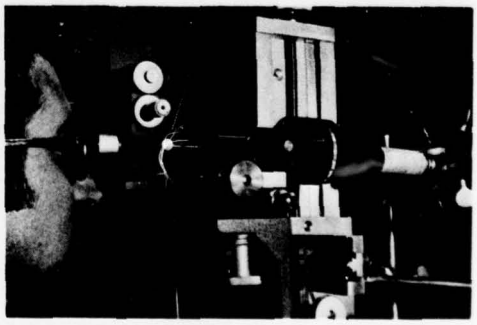
Daytime use of NVG's is possible with the newly developed outserts. The daytime use of outserts enhances safety and could reap a saving of training dollars.

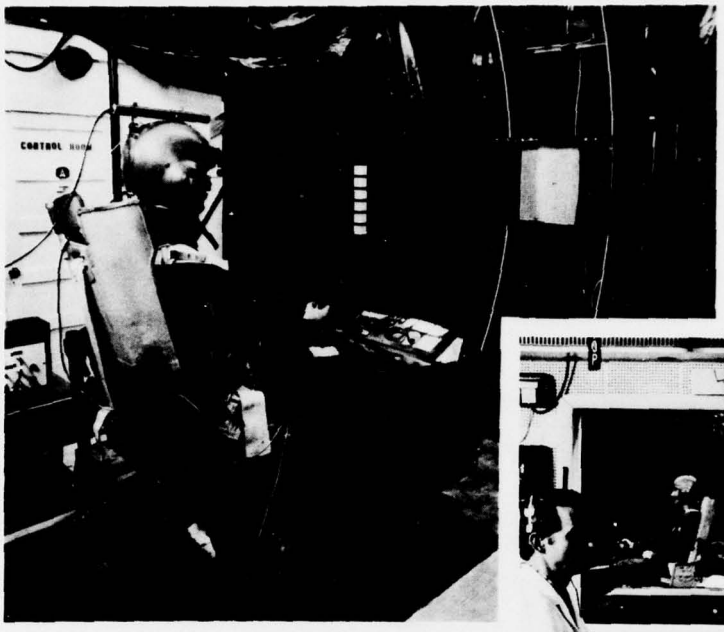
Demonstrating the "how" of IHADSS.



Integrated Helmet and Display Sight System (IHADSS).

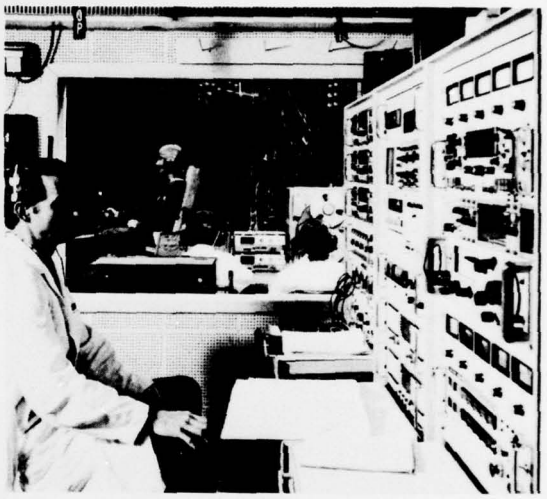
Visually coupled display system research is striving to determine measurement techniques to be used in the medical assessment of such displays. The progress in display technology must be compatible with the human.



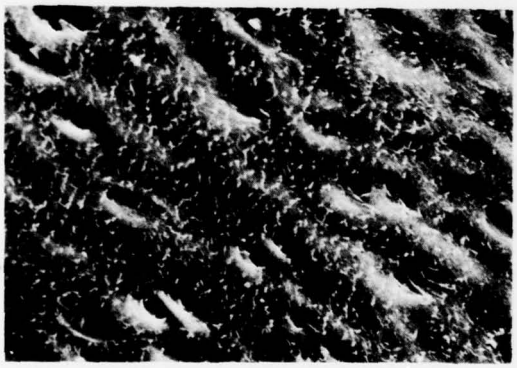


Helmet Mounted Sight System Experiment Using Simulated Helicopter Vibrations.

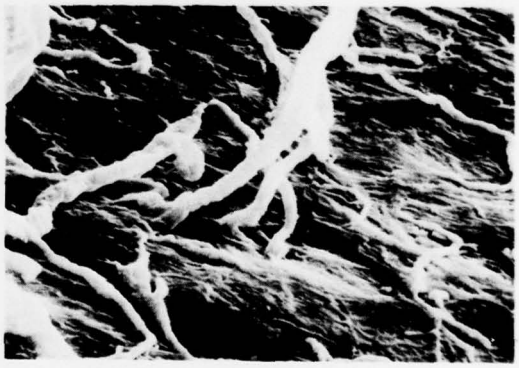
Control Room for the Vibration Laboratory.



Effects of long-term, low frequency vibration are unknown. Studies simulating helicopter and vehicle vibrations are being conducted to provide valid and medically pertinent information with respect to immediate field aeromedical problems.



Normal Bone Joint Surface



Damaged Bone Joint Surface

Scanning Electron Micrographs have differentiated normal and damaged bone surfaces. Trauma causes filaments to be torn from the joint surfaces, as seen in photo on the right.

Electromyographic studies are being conducted to determine the effects of vehicle vibration on the ability of the muscles to perform their usual tasks.

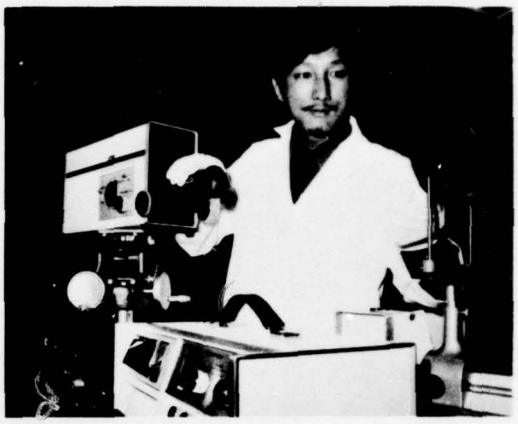
A quantitative technique will assist researchers in determining the extent to which whole body vibration and asymmetric head loading affect muscular stress levels in the neck and back of human subjects.

Amplification adjustments are made to the electromyograph.

Visual work load of aviators is filmed using an eye mark recording system that enables researchers to determine precisely the visual cues an aviator seeks. These precise measurements provide an objective data base that is essential for efficient cockpit design, navigation instruments, and even mission planning.

Photometeric Calibration Laboratory

Equipment that meets the National Bureau of Standards requirements is used to maintain calibration of sensitive light measurement equipment.

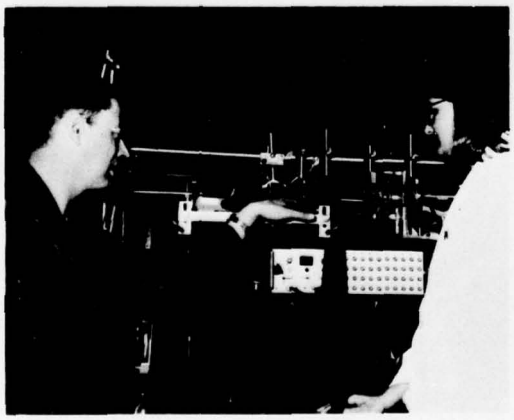


Non-Contact Tonometer

Intraocular pressure is monitored in experiments dealing with eye physiology.

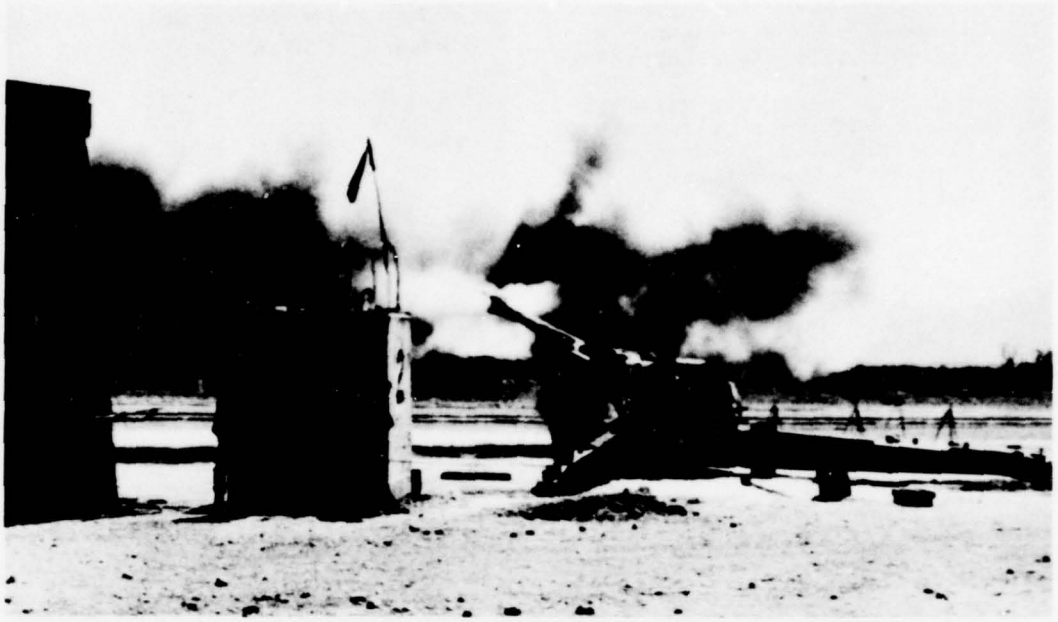
XM-29 Mask with Combat Spectacles

All the visual and optical aspects of the XM-29 mask were evaluated. The combat spectacles were developed to fit comfortably and safely under the mask.



Four-Channel Maxwellian Viewing System

The Maxwellian viewing system is designed and fabricated to investigate the interaction of the photorecepter cells in the eye.



M198, 155mm Towed Howitzer. The medical effects of blast-over pressure on hearing loss are studied both in the field and in the laboratory.

Portable Mass Spectrometer.

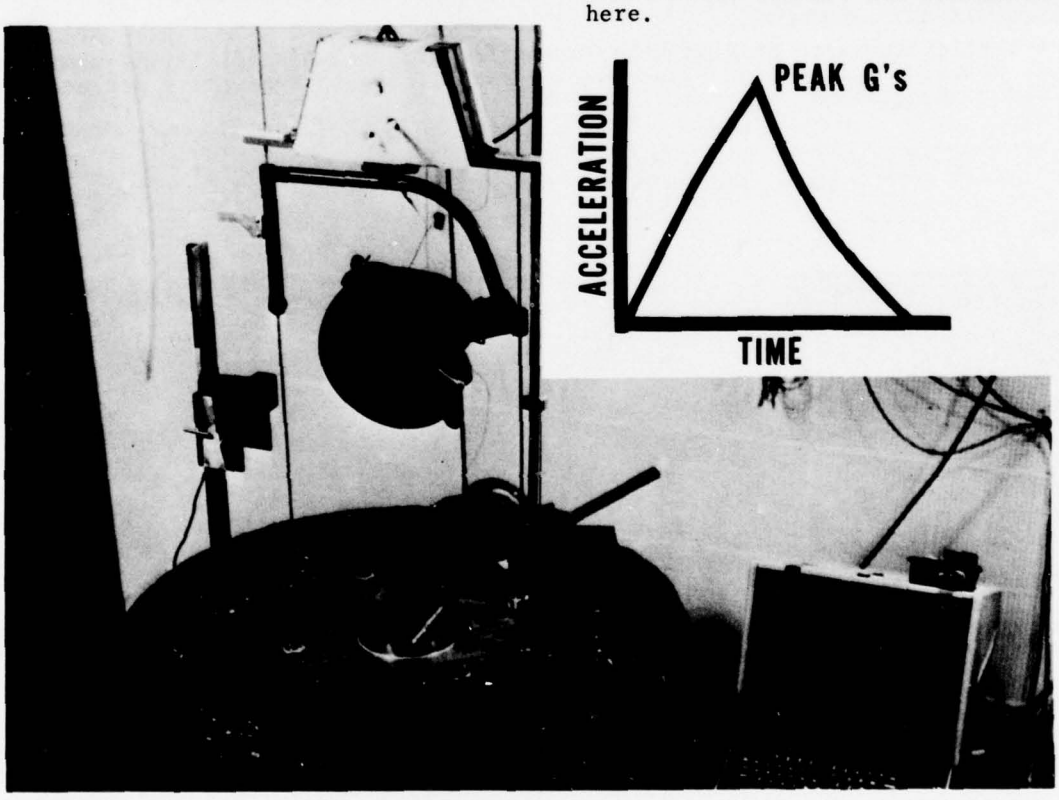
A mass spectrometer being used in the investigation of toxicologic hazards of aircraft weapons systems.

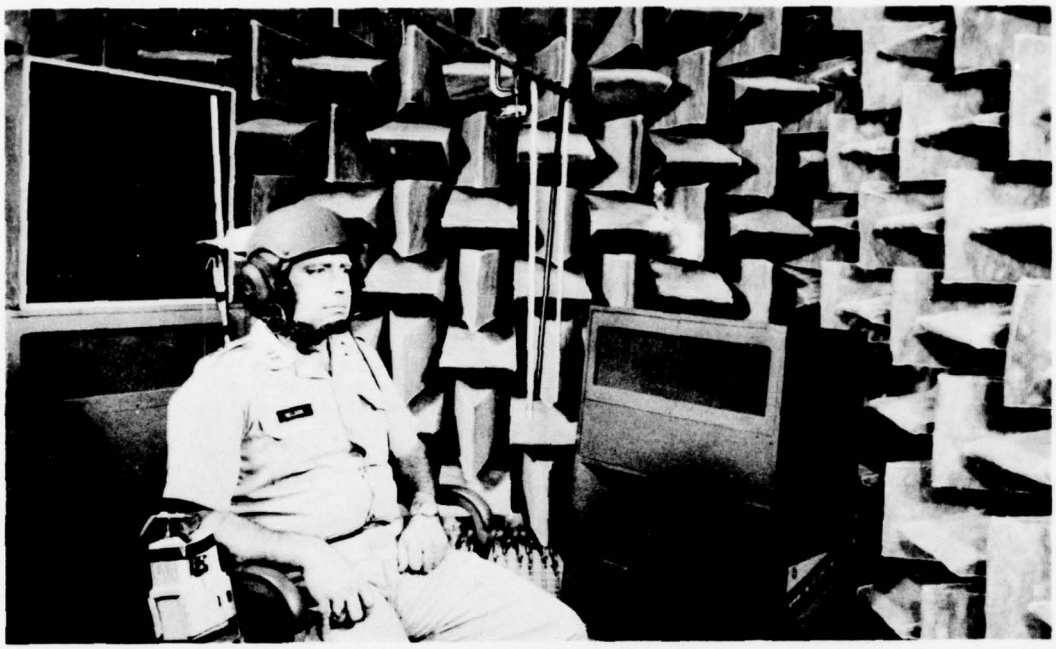
Downwash of UTTAS

High downwash "wind" creates an environment of wind chill, flying debris, and over pressure.

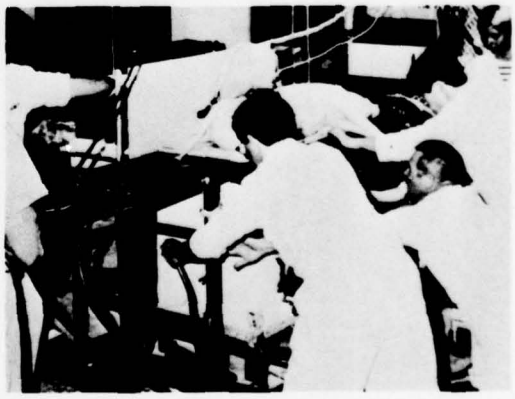
Helmet Drop Tower

Helmet damage/head injury correlation studies are conducted here.

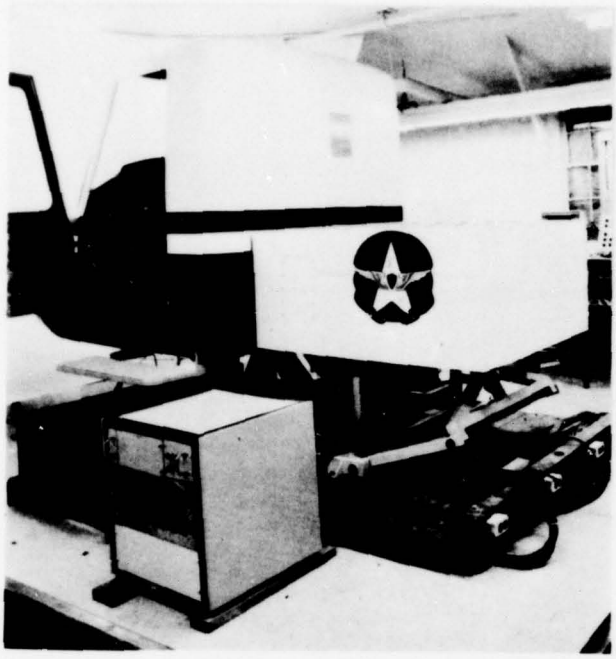




Anechoic Chamber. This physical acoustics measurement facility is used in research programs on blast-over pressure, hearing protective devices and communications systems.

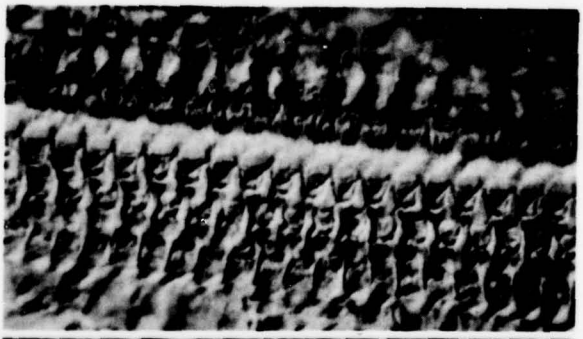


Research was conducted to provide a complete understanding of the nature of burn production and thermal protection in a given environment. A model is being produced which will be valuable in evaluating thermal protective clothing.



Helicopter Research Simulator. Research into aviator workload and aviator performance is conducted in USAARL's research simulator.

Normal Auditory Sensory Cells
500X Magnification

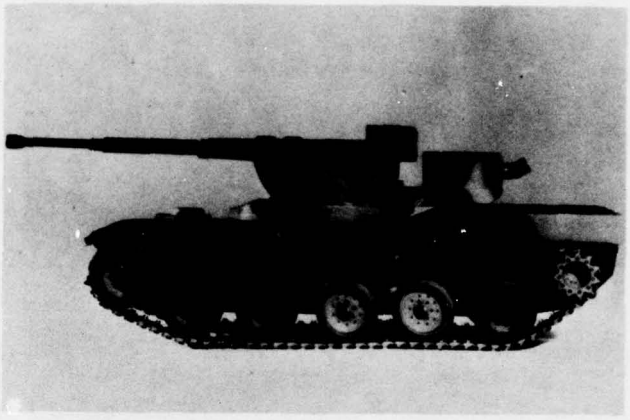


Damaged Auditory Sensory Cells
500X Magnification

Research efforts into the effects of low-frequency noise have found a high-frequency hearing loss due to the low-frequency noise.

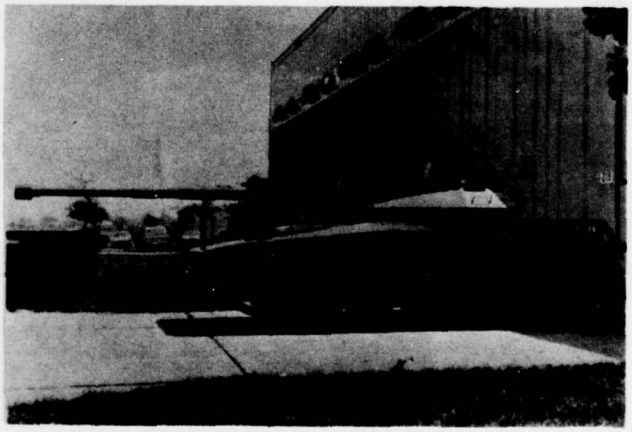
High Mobility and Agility (HIMAG)--Test Bed Vehicle

Investigations are conducted into the physiological and psychological stresses on the crew of the HIMAG.



High Survivability Test Vehicle (Light)--HSTV(L)

This small, maneuverable vehicle provides a low profile. Research efforts are directed toward the medical aspects of vibration, confinement, and seating positions.



OUR RESEARCH REQUIRES

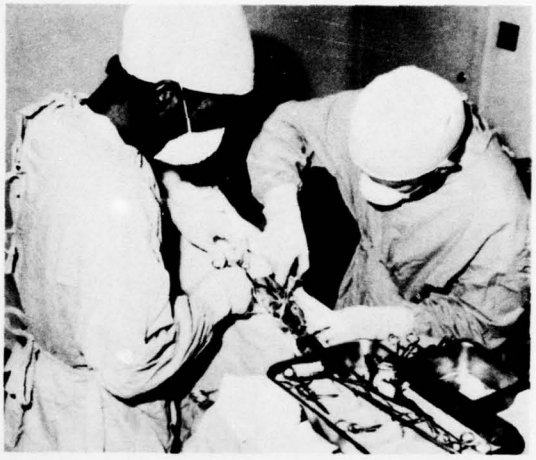
AVIATION...

Aircraft are an important feature of USAARL's research efforts. USAARL has five aircraft: JUH-1H, JOH-58, JUH-1M, JU-21, and JOV-1. All five aircraft carry the "J" that designates they have been modified for research use.

These aircraft and pilots are vital elements in authenticating the experiences from which data are collected. They are utilized during studies dealing with work load, fatigue, oxygen systems, night vision goggles, medevac missions, and in many other research efforts.

COMPARATIVE MEDICINE...

Comparative medicine uses animal models to study human disease problems. Surgical suites, x-ray units, and small animal facilities are a part of the Laboratory's available comparative medicine facilities.



Surgical Suite

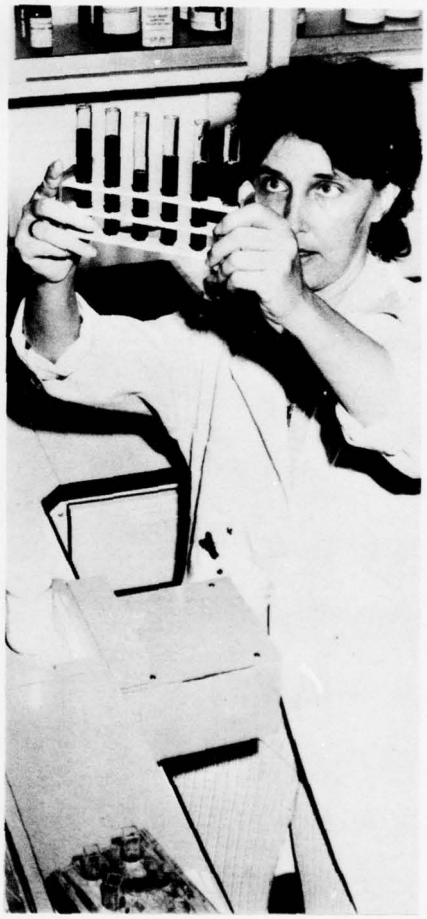
Small Animal Facility

X-Ray Unit

AND BIOCHEMISTRY...

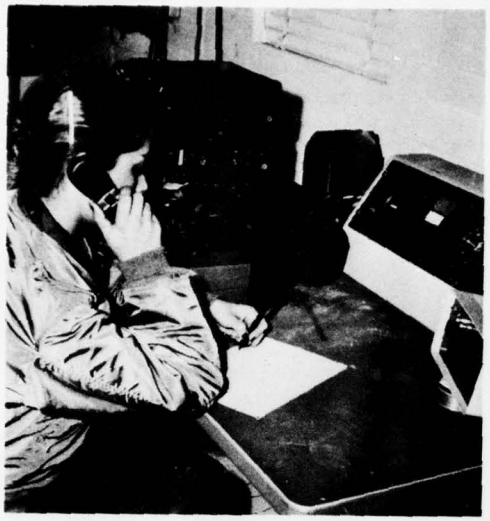
The biochemical indicators of stress and the toxicological hazards of weapons systems are investigated using equipment that ranges from the test tube through the computer integrated mass spectrometer, to the infrared mass spectrometer.

Infrared Mass Spectrometer



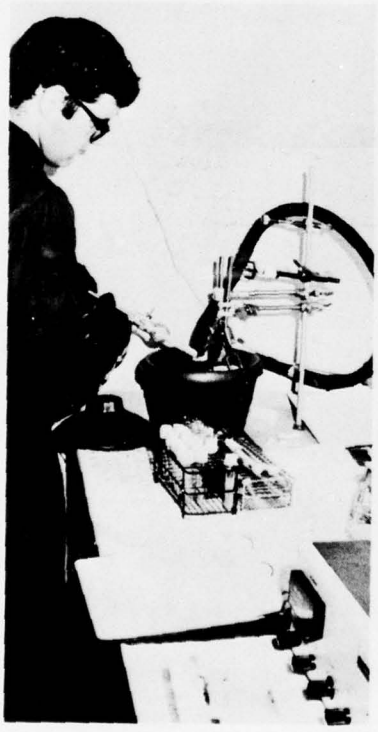
Computer Integrated Mass Spectrometer

FIELD

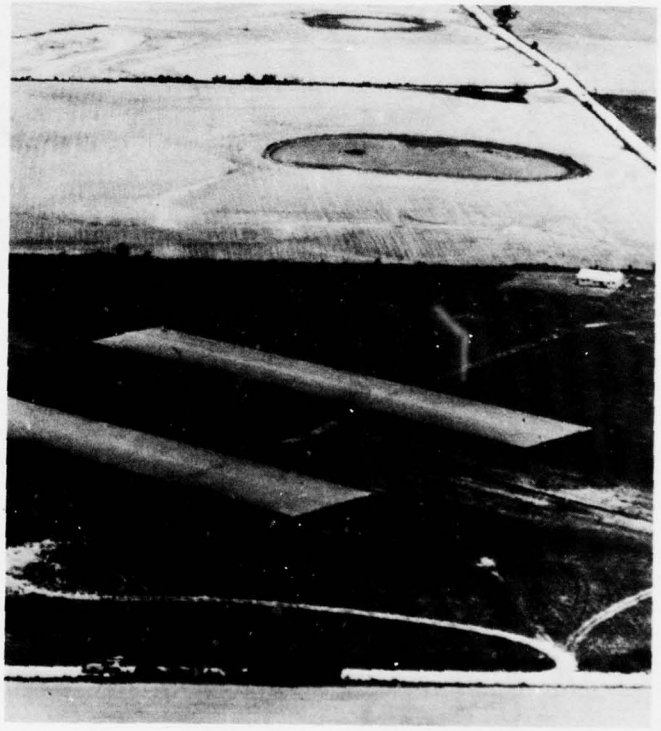


Highfalls Field Radio

USAARL's field facilities are unique among military research laboratories. These facilities enable researchers to simulate conditions the aviator encounters in his normal duties. These facilities are particularly important in fatigue, stress and workload research.



Chemical Analysis

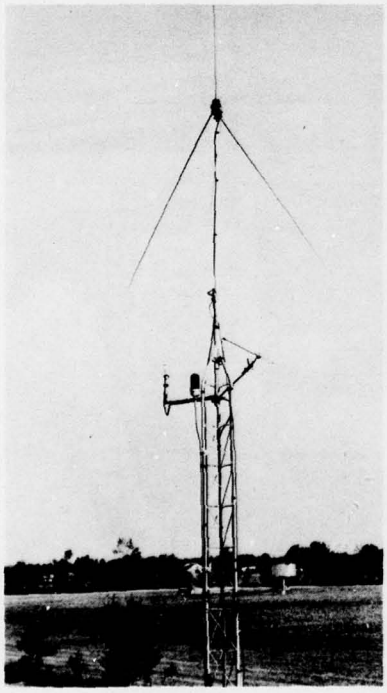


Aerial View of Highfalls Stagefield and Facility

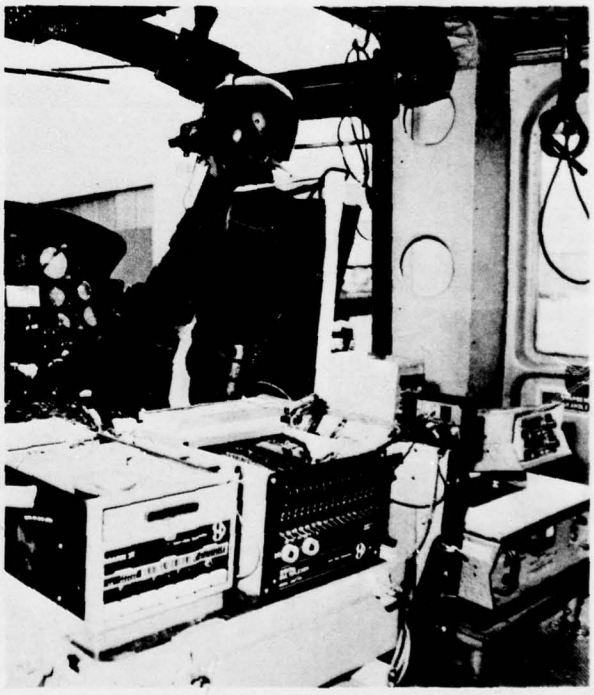
FACILITIES...

An area approximately 125 square miles is constantly monitored by a ranging system (HIMS) that records an aircraft's movements and position within three feet of its actual position on the ground. Four antenna sites are used and maintained to assure complete coverage. The Highfalls base facility has served as home for subjects, laboratory for research, and control tower for aircraft.

Pupillary Reflex Response



Antenna Site

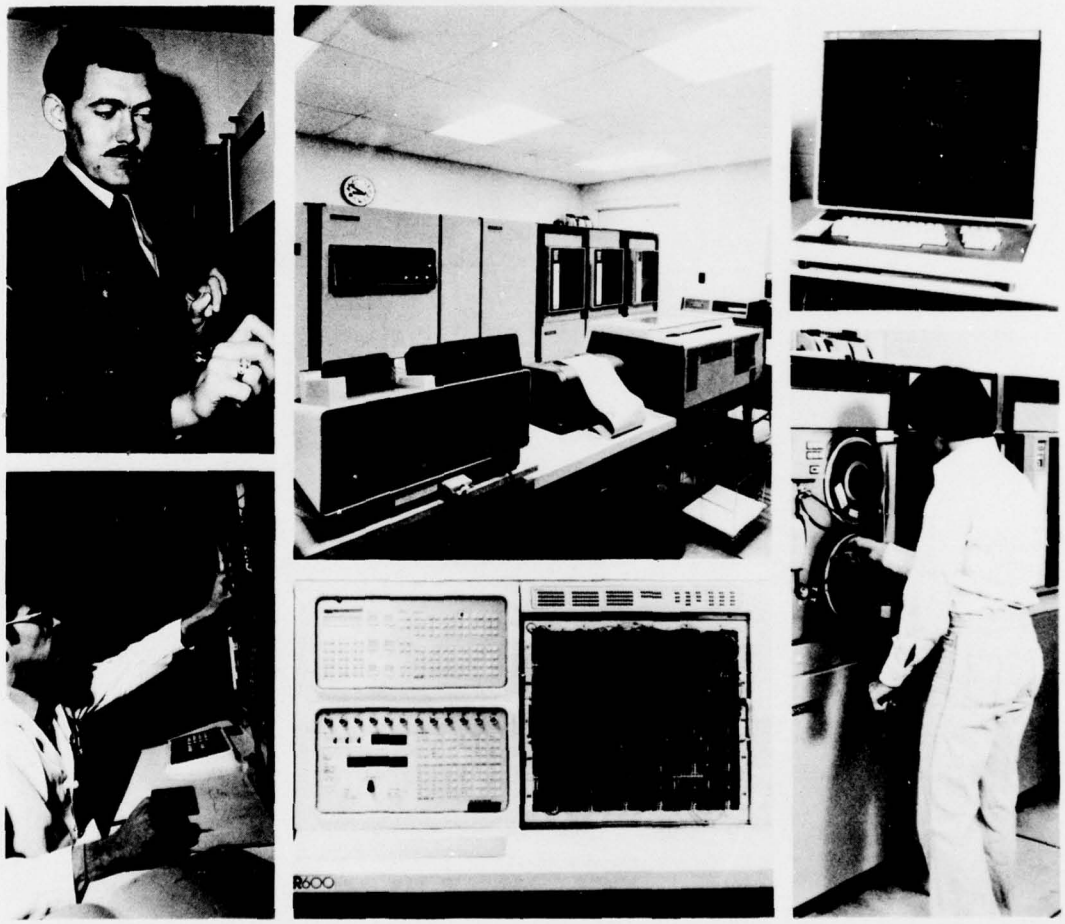


Helicopter Inflight
Monitoring System

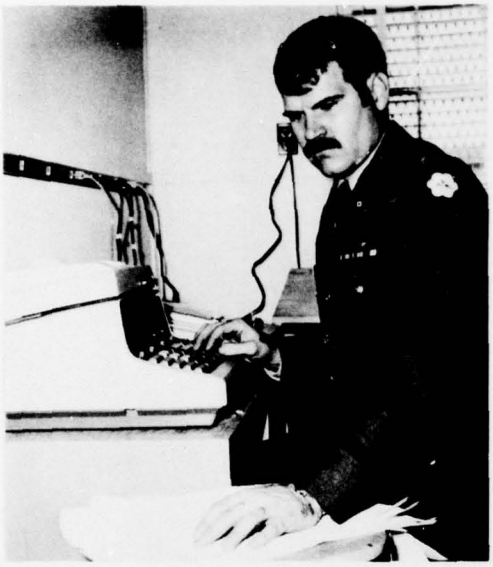
COMPUTERS...

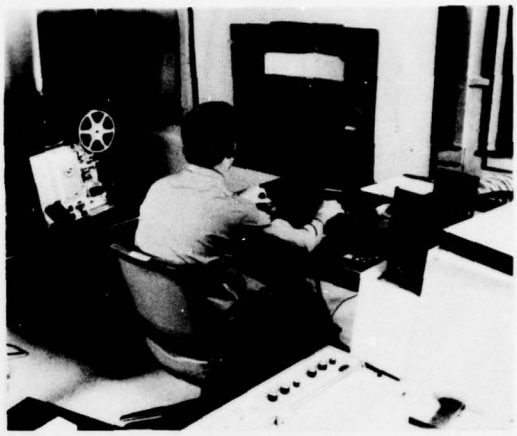
Research requires cumulative data collection efforts and the product of those efforts must be stored but readily available. This storage and ready retrieval of data is accomplished at USAARL through the use of many subsystems feeding data into the hybrid computer. The subsystems at on-site laboratories, on board aircraft, or in the field enable researchers and technicians to gather data rapidly and accurately and, in many cases, provide simultaneous analysis.

SEL 8500 COMPUTER



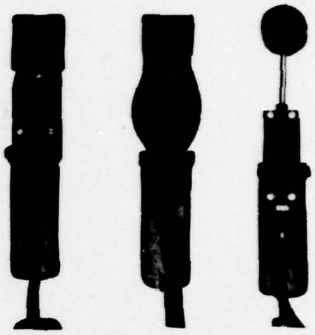
DATA ANALYSIS...



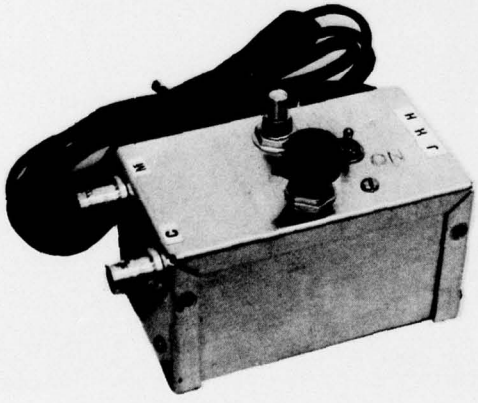


USAARL is

SPH-4 Helmet



Microphones

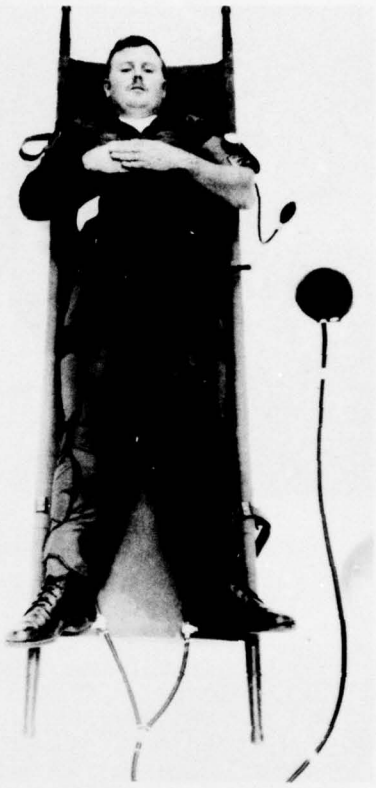


High Light Attenuation Processor

Combat Spectacles

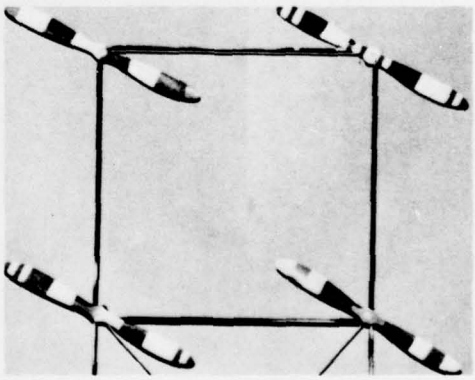
DEVELOPMENTS

Automated Inflight Blood Pressure Monitor



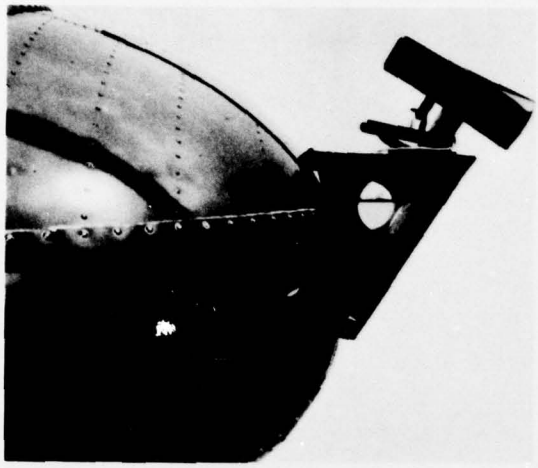
Military Anti-Shock Trousers

Crashworthy Troop Seat



Painting Patterns to Increase Blade Conspicuity

USAARL is MEDICAL



Doppler Navigation System

Oxygen System

Hoist Performance

XM-29 Mask

EVALUATION OF EQUIPMENT

Fire Suppressant Systems

Personnel Armor System for Ground Troops--PASGT Helmet

Prototype Helmets--Foreign and Domestic

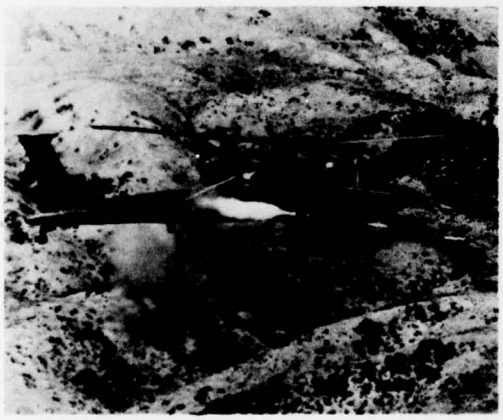
Miniature Head-Up Display

Helmets returned for evaluation in the Life Support Equipment Retrieval Program (LSERP).

AND OF THE MAN-MACHINE ENVIRONMENT

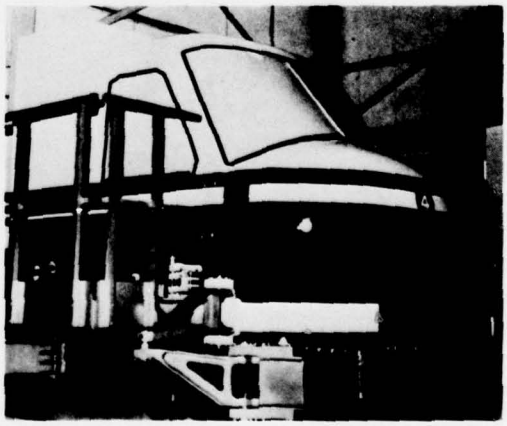
Iranian Bell 214

Blackhawk



UH-1 Flight Simulator

Advanced Attack Helicopter



SUPPORT SERVICES

ARE FURNISHED BY

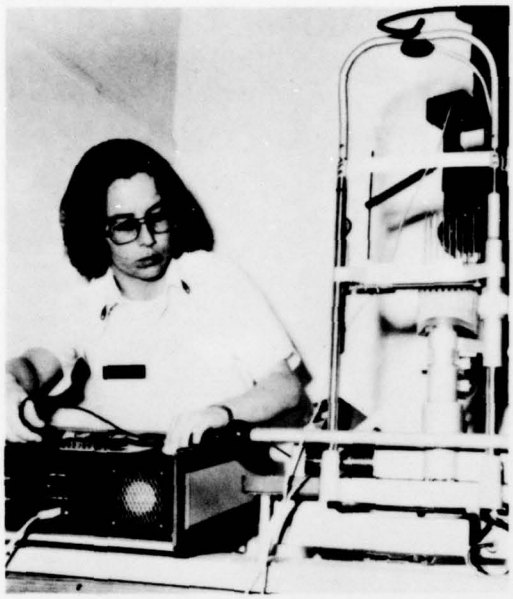
Fiscal Management

Scientific Photography

Medical Illustration

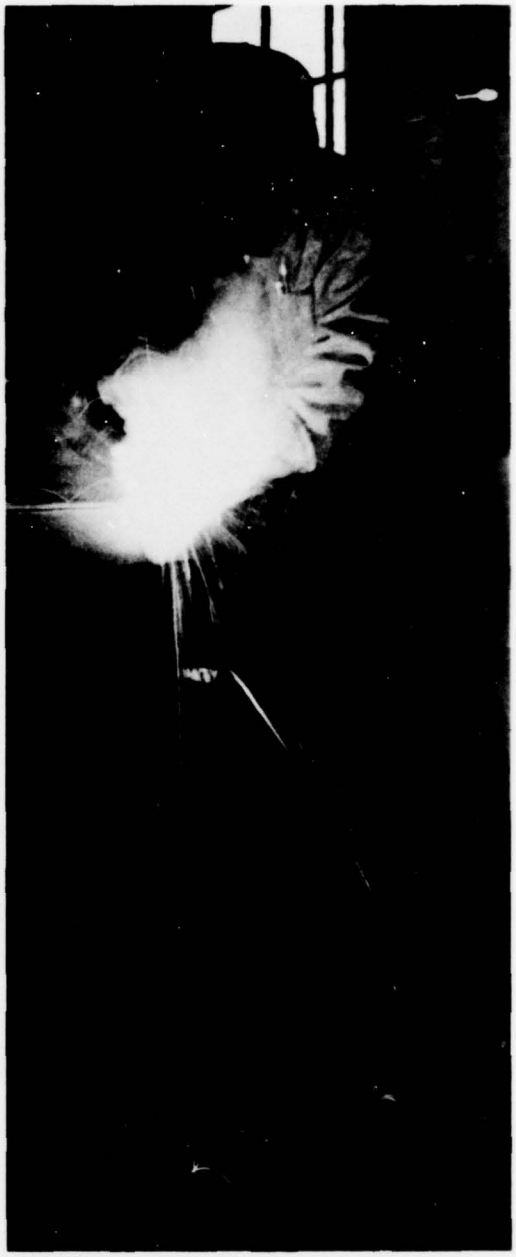
Personnel

AND BY



Biomedical Equipment Maintenance

Administrative Services



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